



GRACO

*First choice when
quality counts.™*

Rev. B

Supersedes Rev. A



This manual contains important
warnings and information.
READ AND KEEP FOR REFERENCE.

INSTRUCTIONS

13:1 Ratio Senator® Pump

1350 psi (9.2 MPa, 92 bar) Maximum Working Pressure

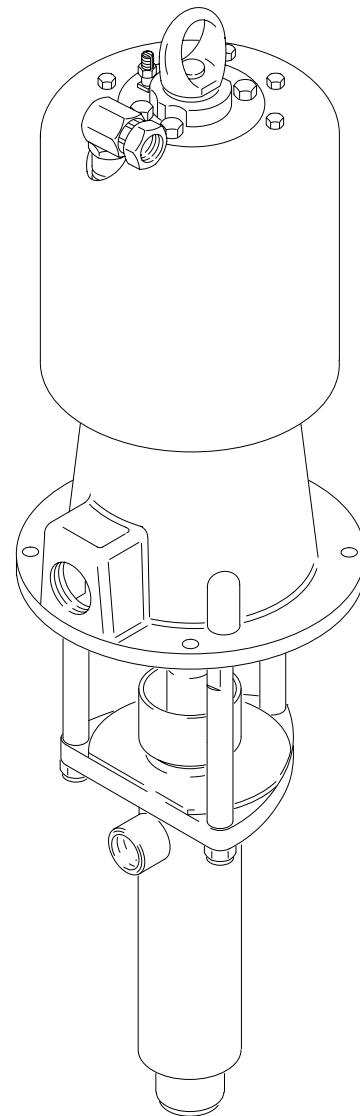
100 psi (0.7 MPa, 7 bar) Maximum Air Input Pressure

Model 230-983, Series A

Corrosion-Resistant

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Symbols

Warning Symbol



This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

Caution Symbol



This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the corresponding instructions.

! WARNING



INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause an extremely serious injury, including the need for amputation. Splashing fluid in the eyes or on the skin can also cause a serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the spray gun/dispensing valve at anyone or at any part of the body.
- Do not put hand or fingers over the spray tip/nozzle.
- Do not stop or deflect fluid leaks with your hand, body, glove, or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the tip guard and the trigger guard on the spray gun/dispensing valve when spraying/dispensing.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun/valve trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 8 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip.
- Tighten all the fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.



TOXIC FLUID HAZARD

Hazardous fluids or toxic fumes can cause a serious injury or death if splashed in the eyes or on the skin, swallowed, or inhaled.

- Know the specific hazards of the fluid you are using. Read the fluid manufacturer’s warnings.
- Store hazardous fluid in an approved container. Dispose of the hazardous fluid according to all local, state, and national guidelines.
- Wear appropriate protective clothing, gloves, eyewear, and respirator.

Warnings are continued on the next page.

! WARNING



FIRE AND EXPLOSION HAZARD

Improper grounding, poor air ventilation, open flames, or sparks can cause a hazardous condition and result in fire or explosion and serious injury.

- Ground the equipment and the object being sprayed/dispensed. See **Grounding** on page 5.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvent or the fluid being sprayed.
- Extinguish all the open flames or pilot lights in the spray/dispensing area.
- Electrically disconnect all the equipment in the spray/dispensing area.
- Keep the spray/dispensing area free of debris, including solvent, rags, and gasoline.
- Do not turn on or off any light switch in the spray/dispensing area while operating or if fumes are present.
- Do not smoke in the spray/dispensing area.
- Do not operate a gasoline engine in the spray/dispensing area.
- If there is any static sparking while using the equipment, **stop spraying/dispensing immediately**. Identify and correct the problem.



EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture, malfunction, or start unexpectedly and result in a serious injury.

- This equipment is for professional use only.
- Read all the instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check the equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. This equipment has a **1350 psi (9.2 MPa, 92 bar) maximum working pressure**.
- Use fluids that are compatible with the equipment wetted parts. See the **Technical Data** section of all the equipment manuals. Read the fluid manufacturer's warnings.
- Route the hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below -40°F (-40°C).
- Do not use the hoses to pull equipment.
- Wear hearing protection when operating this equipment.
- Comply with all applicable local, state, and national fire, electrical, and other safety regulations.



MOVING PARTS HAZARD

Moving parts, such as the air motor piston, can pinch or amputate fingers.

- Do not operate the equipment with the air motor shield removed.
- Keep clear of any moving parts when starting or operating the equipment.

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Installation

General Information

NOTE: Reference numbers and letters in parentheses in the text refer to the callouts in the figures and the parts drawing.

NOTE: Always use Genuine Graco Parts and Accessories, available from your Graco distributor.

Grounding

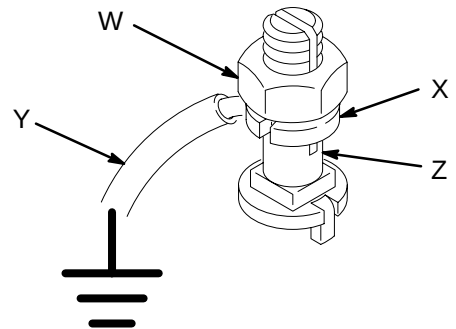
**WARNING**

**FIRE AND EXPLOSION HAZARD**
Before operating, ground the system as explained below. Also read the section **FIRE AND EXPLOSION HAZARD** on page 3.

To reduce the risk of static sparking, ground the pump and all other components used or located in the spray/dispensing area. Check your local electrical code for detailed instructions for your area and type of equipment and be sure to ground all of these components.

- **Pump:** loosen the grounding lug locknut (W) and washer (X). Insert one end of a 12 ga (1.5 mm²) minimum ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. See Fig. 1. Connect the other end of the wire to a true earth ground. Order Part No. 237–569 Ground Wire and Clamp.
- **Air and Fluid Hoses:** Use only electrically conductive hoses with a maximum of 500 feet (150 m) combined hose length to ensure grounding continuity.
- **Air Compressor:** follow the air compressor manufacturer's recommendations
- **Spray gun/dispensing valve:** obtain grounding through connection to a properly grounded fluid hose and pump.

- **Fluid supply container:** according to local code.
- **Object being sprayed:** according to local code.
- **All solvent pails** used when flushing, according to local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts grounding continuity.
- **To maintain grounding continuity when flushing or relieving pressure,** always hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun.



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Fig. 1

Flushing Safety

**WARNING**

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Grounding** at left. Follow the **Pressure Relief Procedure** on page 8, and remove the spray tip/nozzle from the gun/dispensing valve. Always use the lowest possible fluid pressure, and maintain firm metal-to-metal contact between the gun/dispensing valve and the pail during flushing to reduce the risk of fluid injection injury, static sparking, and splashing.

Installation

System Accessories

Refer to Fig. 2 for a typical installation of an air-assisted airless system.

WARNING

A bleed-type master air valve (X) and a fluid drain valve (T) are required in your system. These accessories help reduce the risk of serious injury, including fluid injection and splashing of fluid in the eyes or on the skin, and injury from moving parts if you are adjusting or repairing the pump.

The bleed-type master air valve relieves air trapped between this valve and the pump after the air is shut off. Trapped air can cause the pump to cycle unexpectedly. Locate the valve close to the pump.

The fluid drain valve assists in relieving fluid pressure in the displacement pump, hose, and gun. Triggering the gun to relieve pressure may not be sufficient.

- **The bleed-type master air valve (X)** is required in your system to relieve air trapped between it and the air motor when the valve is closed (see the **WARNING** above). Be sure the bleed valve is easily accessible from the pump, and is located **downstream** from the air regulator.
- **The air regulator (R)** controls pump speed and outlet pressure by adjusting the air pressure to the pump. Locate the regulator close to the pump, but **upstream** from the bleed-type master air valve (X).
- **The air manifold (Z)** has a swivel air inlet. It mounts to the wall bracket, and provides ports for connecting lines to air-powered accessories.
- **The fluid filter (U)** includes a 60 mesh (250 micron) stainless steel element to filter particles from the fluid as it leaves the pump.
- **The fluid drain valve (T)** is required in your system to relieve fluid pressure in the hose and gun (see the **WARNING** above).
- **The suction hose (V) and tube (W)** allow the pump to draw fluid from a 200 liter (55 gallon) drum.

Air and Fluid Hoses

Be sure all air hoses (A, K) and fluid hoses (G) are properly sized and pressure-rated for your system. Use only electrically conductive hoses.

1. Connect one end of the fluid line (G) to the filter outlet swivel. Connect a fluid hose to each gun (H). Install a fluid shutoff valve (P) at each gun drop. **Do not** install the spray tip in the gun yet.
2. Close the bleed valve (X) and air regulator (R). Connect the air hose (A) to the swivel inlet of the air manifold (Z). In air-assisted airless systems, connect an air supply line (K) with regulator (L) and shutoff valve (M) to the air inlet of each gun.

Air Line Accessories

1. Install an **air line filter (B)** in the main air line, to remove harmful dirt and moisture from the compressed air supply.
2. Install a **second bleed valve (C)** in the main air line, to isolate the accessories for servicing.
3. Install a **drain valve (D)** at the bottom of each air line drop, to drain off moisture.
4. To provide automatic lubrication of the air motor, install an **air line lubricator (E)** downstream from the red-handled bleed-type master air valve (X).
5. Install a **pump runaway valve (F)**. The runaway valve will automatically shut off the air to the pump if the pump starts running too fast. A pump that runs too fast can be seriously damaged.

Installation

KEY

- A Electrically Conductive Air Hose
- B Air Line Filter
- C Bleed-Type Master Air Valve (for accessories)
- D Air Line Drain Valve
- E Air Line Lubricator
- F Pump Runaway Valve
- G Electrically Conductive Fluid Line
- H Air-Assisted Airless Spray Gun
- J Fluid Shutoff Valve
- K Electrically Conductive Gun Air Hose
- L Gun Air Regulator
- M Gun Air Shutoff Valve

- N Fluid Pressure Relief Valve (required in low pressure air-assisted airless systems)
- P Pump
- R Pump Air Regulator
- S Pump Wall Bracket
- T Fluid Drain Valve (required)
- U Fluid Filter
- V Suction Hose
- W Suction Tube
- X Bleed-Type Master Air Valve (required, for pump)
- Y Ground Wire (required; see page 5 for installation instructions)
- Z Air Manifold

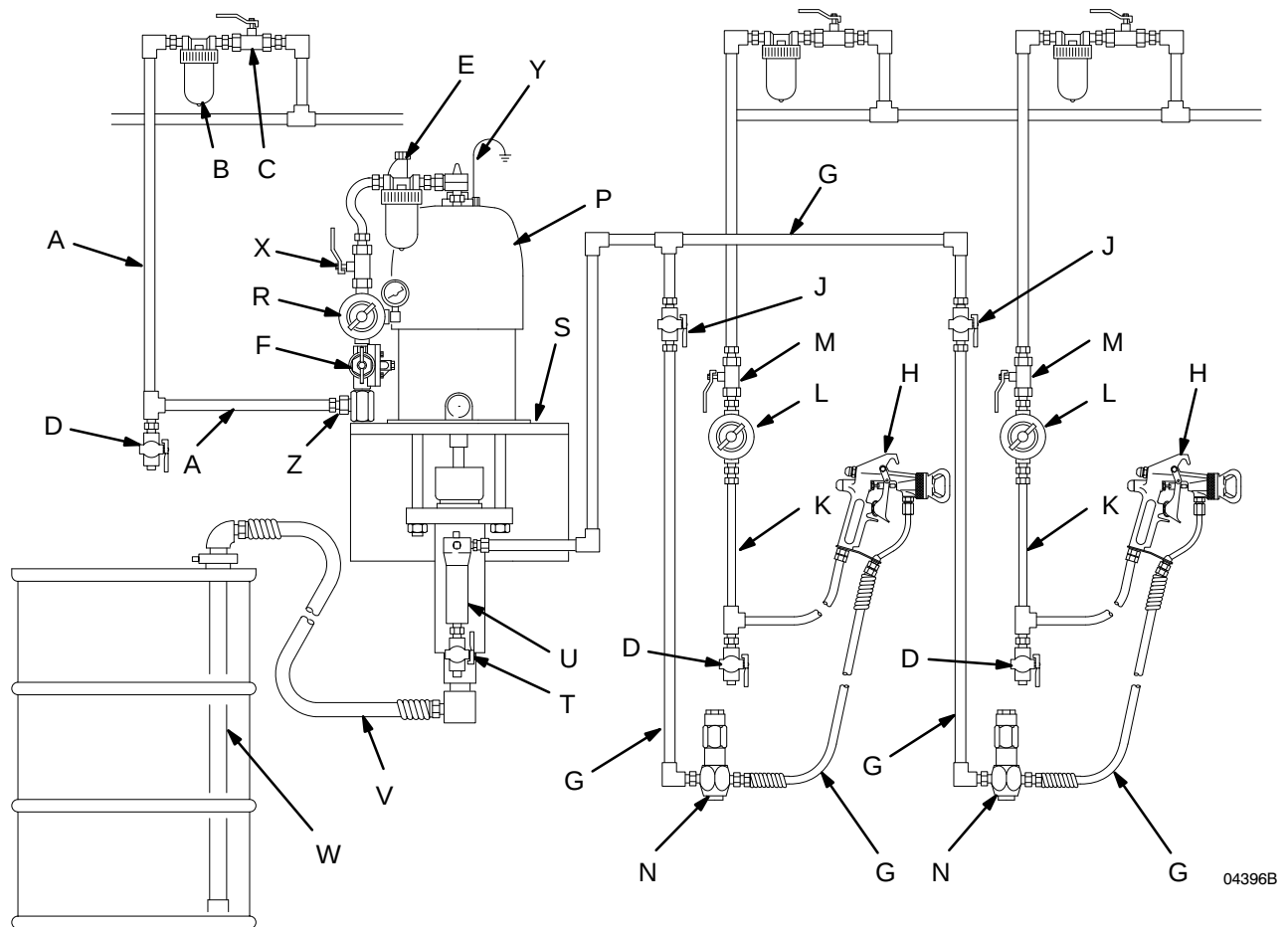


Fig. 2

Operation

WARNING

To reduce the risk of serious injury, never operate the pump with the air motor shield removed. The moving piston behind the shield can pinch or amputate fingers.

Pressure Relief Procedure

WARNING



INJECTION HAZARD

Fluid under high pressure can be injected through the skin and cause serious injury. To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment,
- or install or clean any part of the system.

1. Lock the trigger safety.
2. Shut off the air to the pump.
3. Close the bleed-type master air valve (required in your system).
4. Unlock the trigger safety.
5. Hold a metal part of the gun/dispensing valve firmly to the side of a grounded metal pail, and trigger the gun/dispensing valve to relieve pressure.
6. Lock the trigger safety.
7. Open the drain valve (required in your system), having a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray again.

If you suspect that the spray tip/nozzle is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly loosen the retaining nut or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the tip/nozzle or hose.

Operation

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

Flush the Pump Before Using

Pumps are tested with lightweight oil which is left in to protect pump parts. To prevent contamination of fluid, flush the pump with a compatible solvent before using it. If the pump is being used to supply a circulating system, allow the solvent to circulate until the pump is thoroughly flushed. See **Flushing Safety** on page 5.

WARNING

Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Grounding** on page 5. **Relieve the pressure**, and remove the spray tip/nozzle from the gun/dispensing valve. Always use the lowest possible fluid pressure, and maintain firm metal-to-metal contact between the gun/dispensing valve and the pail during flushing to reduce the risk of an injection injury, static sparking, and splashing.

Starting and Adjusting the Pump

1. Trigger the spray gun/dispensing valve and slowly open the air supply valve until the pump starts [about 40 psi (2.8 bar)]. Allow the pump to cycle slowly until all the air is pushed out of the lines. Release the trigger; the pump will stall against the pressure.

2. In a direct supply system, when the pump and the lines are primed, and adequate air pressure and volume are supplied, the pump will start and stop as the spray gun is triggered and released. In a circulating system, the pump will run continuously and speed up or slow down with the increase or decrease of the air supply until the air supply is shut off.
3. Use an air regulator to control fluid pressure and pump speed. Always use the lowest air pressure necessary to obtain the desired results. Higher pressures waste fluid and cause premature wear of the pump packings and spray tip/nozzle.
4. Keep the packing nut/wet-cup half (101) full with TSL to help extend the life of the packings. Check the tightness of the packing nut/wet-cup weekly. It should be tight enough to prevent leakage, but no tighter. A wrench (15) is provided for tightening the nut. See the Parts Drawing on page 12. Always **relieve the pressure** before adjusting the packing nut.
5. Never allow the pump to run dry of the fluid being pumped. A dry pump will quickly accelerate to a high speed, possibly damaging itself. If your pump accelerates quickly, or is running too fast, stop it immediately and check the fluid supply. If the supply container is empty and air has been pumped into the lines, refill the supply container and prime the pump and the air lines with fluid. Be sure to eliminate all air from the fluid system, or flush the pump as described in **Shutdown and Care of the Pump** on page 10.

The pump runaway valve (M) senses when the pump is running too fast and can stop the pump before it can damage itself.

Maintenance

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. Always flush the pump with a compatible solvent before fluid can dry in the pump and the hoses.
3. At the end of the day, follow the flushing procedure above, and flush the pump thoroughly with a compatible solvent. Drain the pump and leave it empty.

Shutdown and Care of the Pump

1. **Relieve the pressure** whenever you shut off the pump. Stop the pump at the bottom of its stroke to keep fluid from drying on the exposed displacement rod and damaging the throat packings.

Troubleshooting

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

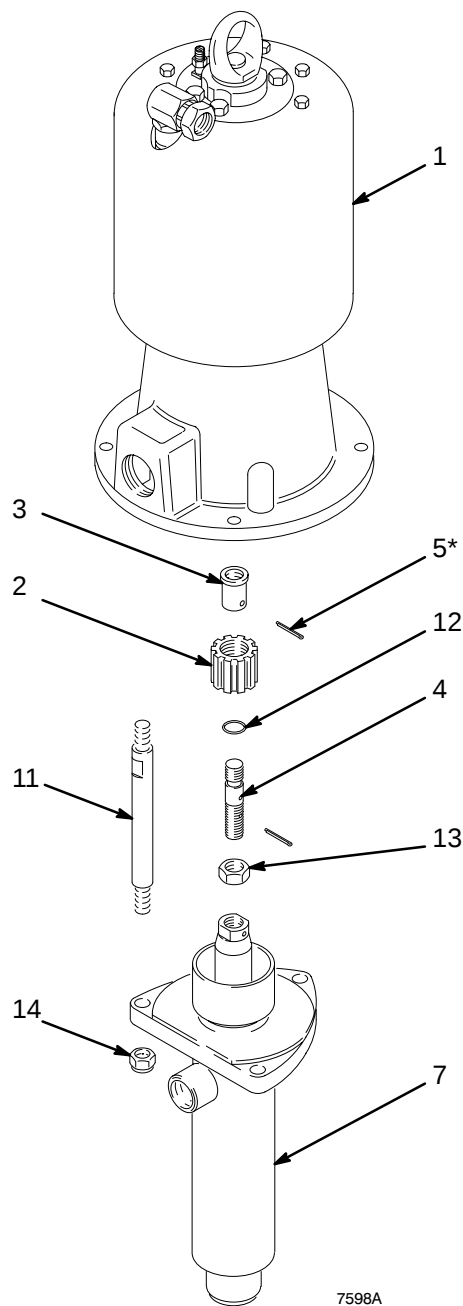
Before servicing this equipment always make sure to **Relieve the Pressure**.

Note: Check all possible causes and solutions before disassembling the pump.

Problem	Cause	Solution
Pump fails to operate.	Restricted line or inadequate air supply.	Clear line or increase line size.*
	Insufficient air pressure; closed or clogged air valves, etc.	Open air valves, clean if necessary.
	Exhausted fluid supply.	Refill; purge all air from pump and fluid lines.
	Damaged air motor.	Service. See air motor instruction manual 307–592.
	Dried fluid seizure of displacement rod.	Remove dried fluid. See manual 307–728.
Pump operates, but output low on both strokes.	Restricted line, or inadequate air line supply.	Clear line or increase line size.*
	Insufficient air pressure. Closed or clogged air valves, etc.	Open air valves, clean if necessary.
	Obstructed fluid line, valves, gun, etc.	Clear.
	Tight throat packing nut.	Loosen. See manual 307–728.
	Exhausted fluid supply.	Refill.
	Check valves need adjustment.	Adjust. See manual 307–728.
Pump operates, but output low on downstroke.	Held open or worn fluid intake valve.	Clear, service. See instruction manual 307–728.
Pump operates, but output low on upstroke.	Held open or worn fluid piston valve or packing leaking.	Clear, service. See instruction manual 307–728.
Erratic or accelerated operation.	Exhausted fluid supply.	Refill and prime.
	Tight throat packing nut.	Loosen. See manual 307–728.
	Held open or worn fluid intake valve.	Clear, service.
	Held open or worn piston valve or packing leaking.	Clear, service.

*** Relieve the pressure** and disconnect the fluid line. Reduce the air pressure to 40 psi (280 kPa, 2.8 bar). If the pump starts when the air is turned on again, the line, etc. is clogged.

Parts



Ref No.	Part No.	Description	Qty.
1	217-540	AIR MOTOR ASSY. See manual 307-592 for parts	1
2	168-210	NUT, shouldered; 1-1/4-12 thread	1
3	168-211	NUT, connecting rod; 3/4-10 thread	1
4	168-212	ROD, connecting	1
5*	100-103	PIN, cotter	2
6†	172-479	TAG, warning (not shown)	1
7	217-527	DISPLACEMENT PUMP ASSY. See manual 307-728 for parts	1
10†	172-447	LABEL; instruction (not shown)	1
11	167-911	ROD, tie; 10-1/2" (267 mm) x 5/8-11 thread	3
12	158-674	O-RING; Buna-N	1
13	101-936	NUT, jam, hex; 3/4-10 thread	1
14	101-712	NUT, lock; 5/8-11 thread	3
15	102-176	WRENCH (not shown)	1

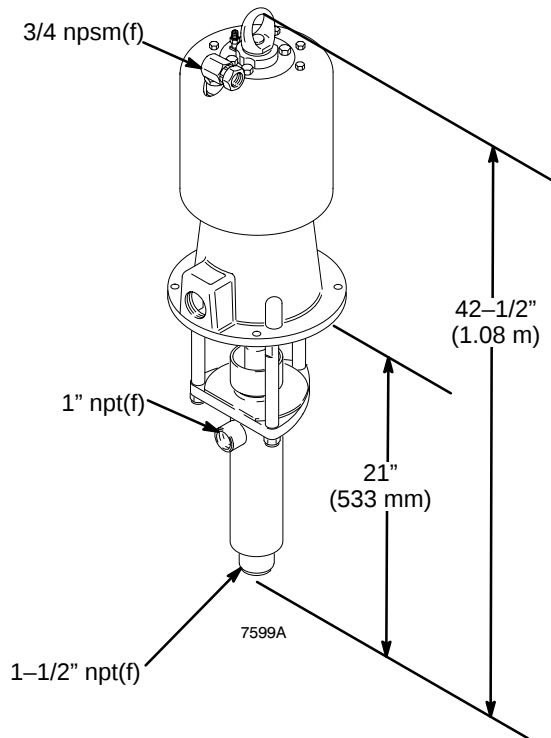
* Recommended Tool Box spare parts. Keep on hand to reduce down time.

† Extra warning labels and tags are available at no charge.

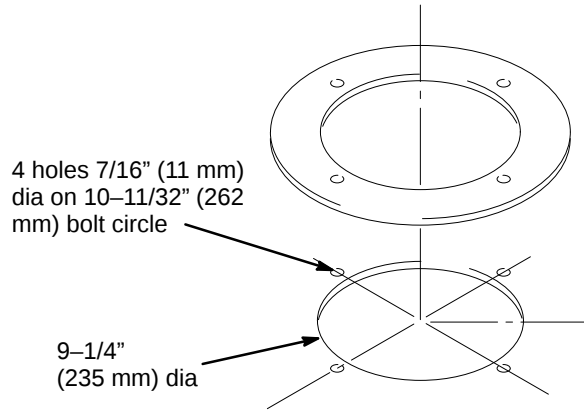
Manual Change Summary

- The entire manual was updated electronically.

Dimensions



Mounting Hole Layout



Technical Data

Category	Data
Air Operating Range	40–100 psi (280–700 kPa, 2.8–7 bar) maximum
Air Volume Needed	See chart below
Maximum Fluid Pressure	1350 psi (9.2 MPa, 92 bar) with max. 100 psi (0.7 MPa, 7 bar) air pressure
Cycles per Gallon	16 (6.1 cycles per liter)
Recommended Maximum Speed	60 cycles per minute
Air Inlet Size	3/4 npsm(f)

Performance Chart

KEY:

Fluid Outlet Pressure – Black Curves
Air Consumption – Gray Curves

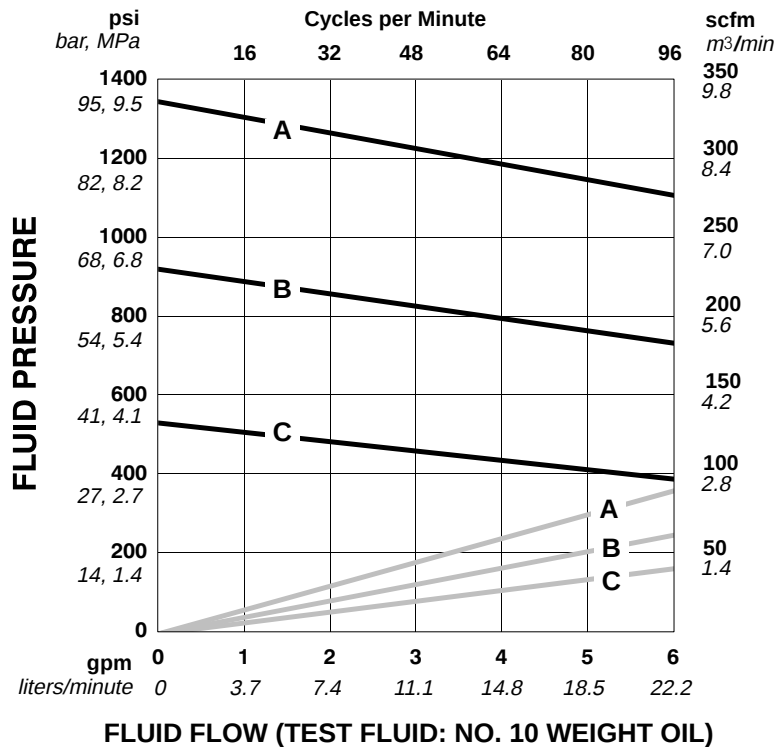
- A 100 psi (0.7 MPa, 7 bar) Air Pressure
B 70 psi (0.49 MPa, 4.9 bar) Air Pressure
C 40 psi (0.28 MPa, 2.8 bar) Air Pressure

To find fluid outlet pressure (psi/bar/MPa) at a specific fluid flow (lpm/gpm) and operating air pressure (psi/MPa/bar):

1. Locate desired flow along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve (black). Follow left to scale to read fluid outlet pressure.

To find pump air consumption (m³/min or scfm) at a specific fluid flow (lpm/gpm) and air pressure (psi/bar/MPa):

1. Locate desired flow along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve (gray). Follow right to scale to read air consumption.



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The Graco Warranty

Graco warrants all equipment listed in this manual which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special extended or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, gas engines, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

Graco Phone Number

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you:
1-800-367-4023 Toll Free.

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